

## REMARKS

In the Office Action dated May 30, 2007, the Examiner took the following action: (1) objected claim 72 due to informalities; (2) rejected claims 4-26, 28-42, 45-55, 69, 70, and 72 under 35 U.S.C. §103(a) as being unpatentable over Roebroeks (US 6736919) in view of Magellan Systems Int. publication of M5 fibers or Blohowiak et al. (US 5869140); (3) rejected claims 27, 43, and 44 under 35 U.S.C. §103(a) as being unpatentable over Roebroeks in view of Magellan Systems Int. publication of M5 fibers or Blohowiak et al. and in further view of Westre et al. (US 6114050). The Applicants respectfully requests reconsideration of the application in view of the foregoing amendments and the following remarks.

### I. Objection to Claim 72

The Examiner objected to claim 72 due to informalities. Applicants have amended claim 72 to correct the informalities noted by the Examiner, and therefore request reconsideration and withdrawal of the objection to the claims.

### II. Rejections under 35 U.S.C. §103(a)

#### Claims 4-27

As amended, claim 4 recites:

4. A fiber-metal laminate comprising:  
*first and second* metallic layers, each metallic layer having an inorganic polymer sol coating formed thereon; and  
at least *three composite* fiber layers disposed between the *first and second* metallic layers, *a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first metallic layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers*

*and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three fiber layers contains a thermosetting resin matrix and a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers. (emphasis added).*

Roebroeks (US 6736919)

Roebroeks teaches a method for making a laminate by applying an adhesive layer in between two metal sheets. According to Roebroeks, prepegs containing straight and parallel filaments are connected to each of the adhesive layers (1:51-57). A doubler is also used as a bridge for the splice in between two aluminum sheets (1:58-64).

Applicants respectfully submit that Roebroeks fails to disclose, teach, or fairly suggest the fiber-metal laminate recited in claim 4. Specifically, Roebroeks fails to teach or suggest a fiber-metal laminate that includes, in relevant part, wherein at least *three composite fiber layers* disposed between the *first and second* metallic layers, *a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first metallic layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction.* Roebroeks is silent to the above-noted limitations. Therefore, claim 4 is allowable over Roebroeks.

Magellen Systems Int.

Magellen Systems describes a type of synthetic fiber namely M5. According to Magellen Systems, high-strength synthetic fiber is one of the “strongest and most versatile fiber technology ever created” (Fiber Overview, page 1, para. 2).

Applicants respectfully submit that Magellen Systems fails to remedy the above-noted deficiencies of Roebroeks. Specifically, Magellen Systems fails to disclose a fiber-metal laminate that includes, in relevant part, wherein at least *three composite fiber layers* disposed between the *first and second* metallic layers, *a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first metallic layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction.* There is no teaching or suggestion in Magellen Systems of these limitations. Therefore, claim 4 is allowable over Magellen Systems, either singly or in combination with Roebroeks.

Blohowiak (US 5869140)

Blohowiak teaches metal-to-resin adhesion. Specifically, Blohowiak teaches a laminate that combines metal and organic adhesive without the use of toxic chemicals in a time saving manner.

Applicants respectfully submit that Blohowiak fails to remedy the above-noted deficiencies of Roebroeks and Magellan Systems. Specifically, Blohowiak fails to teach or suggest a fiber-metal laminate that includes, in relevant part, wherein at least *three composite fiber layers* disposed between the *first and second* metallic layers, *a first one of the composite fiber layers* being adjacent to the inorganic polymer sol coating of the first metallic layer and *a third one of the composite fiber layers* being adjacent to inorganic polymer sol coating of the second metallic layer, *the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction*, and *a second one of the composite fiber layers* being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction. Blohowiak is silent to the above-noted limitations. Accordingly, claim 4 is allowable over Blohowiak, either singly or in combination with Roebroeks and Magellan Systems.

Westre (US 6114050)

Westre teaches a laminate with a titanium-polymer hybrid. Specifically, Westre teaches that the resin of the laminate is selected to tenaciously bond with the titanium alloy foil. (3:27).

Westre fails to remedy the above-noted deficiencies of Roebroeks, Magellan Systems, and Blohowiak. Specifically, Westre fails to teach or suggest a fiber-metal laminate that includes, in relevant part, wherein at least *three composite fiber layers* disposed between the *first and second* metallic layers, *a first one of the composite fiber layers* being adjacent to the inorganic polymer sol coating of the first metallic layer and *a third one of the composite fiber layers* being adjacent to inorganic polymer sol coating of the second metallic layer, *the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction*, and *a second one of the composite fiber layers* being disposed between

*and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction.* Westre is silent to the above-noted limitations. Accordingly, claim 4 is allowable over Westre, either singly or in combination with Roebroeks, Magellen Systems, and Blohowiak.

Claims 5-27 depend from claim 4 and are allowable over the Cited References (Roebroeks, Magellan Systems, Blohowiak, and Westre) at least due to their dependencies on claim 4, and also due to additional limitations recited in those claims.

In particular, claim 26 recites the laminate of Claim 4, further comprising: a pair of inner metallic layers disposed between at least two of the composite fiber layers; and at least one core layer disposed between the pair of inner metallic layers. Support for this claim is provided, for example, by Figure 5B of Applicants' specification, and the corresponding portions of the detailed description. These additional limitations are also not disclosed, taught, or fairly suggested by the Cited References.

#### Claims 28-42

Amended claim 28 contains limitations similar to those described above with respect to claim 4. Specifically, claim 28 recites:

28. A fiber-metal laminate comprising:  
first and second layers of aluminum alloy, each aluminum alloy layer having an inorganic polymer sol coating formed thereon; and  
at least three composite resin-fiber plies bonded between the first and second aluminum alloy layers, a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first aluminum alloy layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second aluminum alloy layer, the first and third resin-fiber plies each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the resin-fiber plies being disposed between and adjacent to the first and third resin-fiber plies and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three plies includes a thermosetting resin matrix and a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers, a majority of the plurality of galvanically non-reactive poly

diimidazo pyridinylene fibers of at least one of the resin-fiber plies being aligned along a primary stress direction.

For reasons similar to those set forth above with respect to claim 4, claim 28 is allowable over the Cited References. Claims 29-44 depend from claim 28 and are allowable over the Cited References at least due to their dependencies on claim 28, and also due to additional limitations recited in those claims.

In particular, claim 43 recites the laminate of Claim 28, further comprising: a pair of inner metallic layers disposed between at least two of the resin-fiber plies; and at least one core layer disposed between the pair of inner metallic layers. Support for this claim is provided, for example, by Figure 5B of Applicants' specification, and the corresponding portions of the detailed description. These additional limitations are also not disclosed, taught, or fairly suggested by the Cited References.

#### Claims 45-55

Amended claim 45 contains limitations similar to those described above with respect to claim 4. Specifically, claim 45 recites:

45. A composite aircraft component comprising:  
first and second aluminum alloy foil layers that are pre-treated each having a thickness in a range from 0.004 inches to 0.025 inches, each aluminum alloy foil layer having an inorganic polymer sol coating formed thereon; and  
at least three polymeric composite fiber layers bonded between the first and second foil layers, a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first aluminum alloy foil layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second aluminum alloy foil layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three composite fiber layers includes a thermosetting resin matrix and a plurality of galvanically non-reactive aligned poly diimidazo pyridinylene fibers, the plurality of galvanically non-reactive poly diimidazo pyridinylene fibers of at least one of the composite fiber layers being aligned along a primary stress direction.

For reasons similar to those set forth above with respect to claim 4, claim 45 is allowable over the Cited References. Claims 46-55 depend from claim 45 and are allowable over the Cited References at least due to their dependencies on claim 45, and also due to additional limitations recited in those claims.

In particular, claim 55 recites the component of Claim 45, further comprising: a pair of inner metallic layers disposed between at least two of the resin-fiber plies; and at least one core layer disposed between the pair of inner metallic layers. Support for this claim is provided, for example, by Figure 5B of Applicants' specification, and the corresponding portions of the detailed description. These additional limitations are also not disclosed, taught, or fairly suggested by the Cited References.

#### Claims 69-70, 72

Amended claim 69 contains limitations similar to those described above with respect to claim 4. Specifically, claim 69 recites:

69. A fiber-metal laminate produced according to a method comprising:  
providing first and second metallic layers, each metallic layer having an inorganic polymer sol coating formed thereon;  
providing at least three composite fiber layers disposed between the first and second metallic layers, each composite fiber layer including a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers having a modulus of elasticity of greater than 270 GPa disposed within a thermosetting resin, wherein a first one of the composite fiber layers is adjacent to the inorganic polymer sol coating of the first metallic layer and a third one of the composite fiber layers is adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction.

For reasons similar to those set forth above with respect to claim 4, claim 69 is allowable over the Cited References. Claims 70 and 72 depend from claim 69 and are allowable over the Cited References at least due to their dependencies on claim 69, and also due to additional limitations recited in those claims.

In particular, claim 72 recites the laminate of Claim 69, wherein the method further comprises forming a pair of inner metallic layers disposed between at least two of the resin-fiber plies; and forming at least one core layer disposed between the pair of inner metallic layers. Support for this claim is provided, for example, by Figure 5B of Applicants' specification, and the corresponding portions of the detailed description. These additional limitations are also not disclosed, taught, or fairly suggested by the Cited References.

### CONCLUSION

For the foregoing reasons, Applicants respectfully submit that pending claims 4-55, 69-70, and 72 are now in condition for allowance. If there are any remaining matters that may be handled by telephone conference, the Examiner is kindly invited to contact the undersigned attorney at the telephone number listed below.

Respectfully Submitted,

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